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Claims

[c1] 1. An apparatus for maneuvering an object in a zero or low-gravity environment, the apparatus comprising:
means for generating a magnetic field in the zero or low-gravity environment; and
a moving object in proximity to the generating means and having a trajectory and speed, the object being sufficiently close to the generating means such that the magnetic field alters at least one of the trajectory and speed of the object.

[c2] 2. The apparatus according to claim 1, wherein the object contains a ferrous material or an electromagnet or holds a static charge.

[c3] 3. The apparatus according to claim 1, wherein the generating means defines an opening of sufficient size to enable the object to move through the opening.

[c4] 4. The apparatus according to claim 3, wherein the generating means is operable to alter only the speed of the object as the object passes through the opening of the generating means.

[c5] 5. The apparatus according to claim 4, wherein the generating means is operable to decelerate the object.

[c6] 6. The apparatus according to claim 4, wherein the generating means is operable to accelerate the object.

[c7] 7. The apparatus according to claim 1, wherein the generating means defines an opening and the generating means is operable to alter only the trajectory of the object as the object moves past the opening.

[c8] 8. The apparatus according to claim 1, wherein the generating means comprises at least one coil.

[c9] 9. The apparatus according to claim 1, wherein the generating means comprises a plurality of coils concentrically aligned.

[c10] 10. The apparatus according to claim 9, wherein the plurality of coils have decreasing sizes in one direction of their concentric alignment.

[c11] 11. The apparatus according to claim 1, wherein the generating means comprises a plurality of coils aligned along an arcuate path.

[c12] 12. The apparatus according to claim 11, wherein each of the coils has an axis, the axes of the coils are aligned as radii of a circle, and the magnetic fields of the coils

push the object away from the coils or pull the object toward the coils.

[c13] 13. The apparatus according to claim 11,wherein each of the coils has an axis, the axes of the coils are aligned as radii of a spiral, and the magnetic fields of the coils pull the object toward the coils or pull the object toward the coils.

[c14] 14. The apparatus according to claim 1, wherein the generating means comprises means for controlling the attitude of the generating means relative to the object.

[c15] 15. The apparatus according to claim 1, wherein the generating means comprises means for receiving and sending communications.

[c16] 16. The apparatus according to claim 1, wherein the generating means comprises:
means for receiving and sending communications; and
means for controlling the attitude of the generating means relative to the object in response to the communications received by the receiving and sending means.

[c17] 17. The apparatus according to claim 1, wherein the generating means comprises means for capturing and storing energy of a back-emf pulse created as the object enters the magnetic field generated by the generating

means.

[c18] 18. The apparatus according to claim 1, wherein the generating means comprises means for capturing and storing solar energy.

[c19] 19. An apparatus for maneuvering an object in a zero or low-gravity environment, the apparatus comprising:
a plurality of coils spaced apart from each other, each coil generating a magnetic field in the zero or low-gravity environment; and
a moving object in proximity to the coil and having a trajectory and speed, the object containing a ferrous material or an electromagnet or holds a static charge and being sufficiently close to at least one of the coils such that the magnetic field of the coil alters at least one of the trajectory and speed of the object.

[c20] 20. The apparatus according to claim 19, wherein the coils are concentrically aligned, each of the coils defines an opening of sufficient size to enable the object to move through the opening, and the apparatus alters the speed of the object as the object passes through the openings of the coils.

[c21] 21. The apparatus according to claim 20, wherein the apparatus is a orbital payload catcher.

[c22] 22. The apparatus according to claim 20, wherein the apparatus is a orbital payload catcher and launcher, and the apparatus further comprises means for capturing and storing energy of a back-emf pulse created as the object enters the magnetic field generated by the coils.

[c23] 23. The apparatus according to claim 19, wherein the coils are aligned along an arcuate path, each of the coils has an axis, the axes of the coils are aligned as radii of a circle, and the magnetic fields of the coils push the object away from the coils or pull the object toward the coils so as to alter the trajectory of the object.

[c24] 24. The apparatus according to claim 19, wherein the each of the coils has an axis, the axes of the coils are aligned as radii of a spiral, and the magnetic fields of the coils pull the object toward the coils or pull the object toward the coils so as to alter the trajectory of the object.

[c25] 25. A method of maneuvering an object in a zero or low-gravity environment, the method comprising the steps of:

generating a magnetic field in the zero or low-gravity environment; and

moving an object having a trajectory and speed in prox-

imity to the magnetic field, the object being sufficiently close to the magnetic field such that the magnetic field alters at least one of the trajectory and speed of the object.

[c26] 26. The method according to claim 25, wherein the magnetic field is generated by at least one coil defining an opening and the magnetic field alters the speed of the object as the object moves through the opening.

[c27] 27. The method according to claim 26, wherein the magnetic field decelerates the object.

[c28] 28. The method according to claim 27, wherein the magnetic field accelerates the object.

[c29] 29. The method according to claim 25, wherein the magnetic field is generated by at least one coil defining an opening and the magnetic field alters the trajectory of the object as the object moves past the opening.

[c30] 30. The method according to claim 25, wherein a plurality of magnetic fields are generated by a plurality of coils concentrically aligned.

[c31] 31. The method according to claim 30, wherein the plurality of coils have decreasing sizes in one direction of their concentric alignment.

[c32] 32. The method according to claim 25, wherein a plurality of magnetic fields are generated by a plurality of coils aligned along an arcuate path.

[c33] 33. The method according to claim 32, wherein each of the coils has an axis, the axes of the coils are aligned as radii of a circle, and the magnetic fields of the coils push the object away from the coils or pull the object toward the coils.

[c34] 34. The method according to claim 32,wherein each of the coils has an axis, the axes of the coils are aligned as radii of a spiral, and the magnetic fields of the coils pull the object toward the coils or pull the object toward the coils.

[c35] 35. The method according to claim 25, further comprising the step of controlling the orientation of the magnetic field relative to the object.

[c36] 36. The method according to claim 25, further comprising the steps:
receiving and sending communications; and
controlling the orientation of the magnetic field relative to the object in response to the received communications.

[c37] 37. The method according to claim 25, further comprising the step of capturing and storing energy of a back-emf pulse created as the object enters the magnetic field.

[c38] 38. The method according to claim 25, further comprising the step of capturing and storing solar energy.

[c39] 39. A method of maneuvering an object in a zero or low-gravity environment, the method comprising the steps of:

providing a plurality of coils spaced apart from each other, each coil generating a magnetic field in the zero or low-gravity environment; and

moving an object having a trajectory and speed in proximity to the coil, the object containing a ferrous material or an electromagnet or holds a static charge and being sufficiently close to at least one of the coils such that the magnetic field of the coil alters at least one of the trajectory and speed of the object.

[c40] 40. The method according to claim 39, wherein the coils are concentrically aligned, each of the coils defines an opening of sufficient size to enable the object to move through the opening, and the speed of the object is altered as the object passes through the openings of the coils.

[c41] 41. The method according to claim 40, wherein the object is caught by the plurality of coils.

[c42] 42. The method according to claim 41, further comprising the steps of:
capturing and storing energy of a back-emf pulse created as the object enters the magnetic field; and
launching the object using the energy.

[c43] 43. The method according to claim 41, wherein the coils are aligned along an arcuate path, each of the coils has an axis, the axes of the coils are aligned as radii of a circle, and the magnetic fields of the coils push the object away from the coils or pull the object toward the coils so as to alter the trajectory of the object.

[c44] 44. The method according to claim 41, wherein the each of the coils has an axis, the axes of the coils are aligned as radii of a spiral, and the magnetic fields of the coils pull the object toward the coils or pull the object toward the coils so as to alter the trajectory of the object.